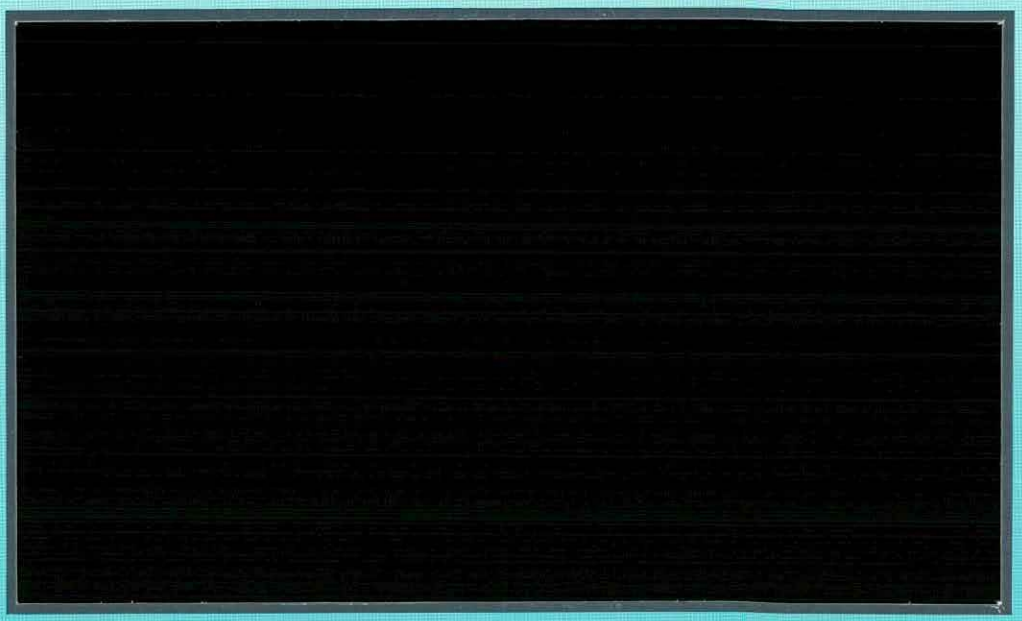
Institute of Terrestrial Ecology



Natural Environment Research Council

ITE has administrative headquarters north and south, and the geographical distribution of its 250 staff in six Research Stations throughout Britain allows efficient use of resources for regional studies and provides an understanding of local ecological and land use characteristics.

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INSTITUTE OF TERRESTRIAL ECOLOGY

(NATURAL ENVIRONMENT RESEARCH COUNCIL)

Project T02052M5

COUNTRYSIDE SURVEY 1990

Mapping the land cover of Great Britain using satellite remote sensing: a demonstrator project in remote sensing. Third Interim Report to the British National Space Centre

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J M Ullyett, M E Sanders & A R Jones

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Environmental Information Centre
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INTRODUCTION

This is the 3rd Interim report, in the series covering this project. The reports have previously comprised Interim reports in December 1990 and January 1992, and brief quarterly reports in September 1990, May, July and October 1991, and May and August 1992. Unlike earlier Interim Reports, made when the project was in its formative stages, this latest example is intentionally brief, similar to the Quarterly Reports, giving progress and only adding details where new developments have occurred (eg in Pattern Analyses and Validation).

AIMS OF THE PROJECT

To compile a digital map of land cover in Great Britain: to make quantitative assessments of accuracy; to integrate the map with other data in a GIS environment, including demonstrator output.

METHODS

The methods were described in the First Interim Report.

SCHEDULE OF WORK

The schedule of work and progress to date are summarised in Figures 1 and 2. The following paragraphs give brief descriptions of the elements shown in Figure 1.

1. The sample-based **field survey** (to be used for validation) was successfully completed in late summer 1990.

2. The **digitising** of field survey maps at ITE Merlewood has been completed for all of the 500-plus squares.

3. The **image search and scheduling** is now complete.

4. **Image orders** are complete.

5. **Class selection** was completed and explained in detail in the second Interim Report (January 1992).

6. All scenes have been **geometrically corrected** and the summer and winter images have been made into composites (see Figure 2).

7. **Field reconnaissance** has been completed for all of Britain.

8. **Training and classification** has been completed for scenes covering some 93% of Great Britain (see Figure 2).

9. **Accuracy assessment** will compare data from the Countryside 1990, 1 km field-survey squares, with the corresponding section of cover map. This comparison will take 3 forms (discussed and agreed with the advisory group of the Countryside 1990 project):

   i. raster-to-raster comparison of 128 of the digitised field squares (cover reduced to 25 types) and of equivalent Landsat-derived data

   ii. scoring of a 5 x 5 dot grid superimposed over vector field-data (full range of attributes) and Landsat-maps for 256 squares

   iii. comparison of summary statistics for all 533 field squares (full list of attributes) and Landsat cover of squares.

   For the first of these, data are being delivered to Monks Wood, in ArcInfo vector format which is then converted to Laserscan Horizon format. We have agreed the target correspondence between the many field cover types and the 25 Landsat classes. Progress to date has compared 120 squares which have been delivered to ITE Monks Wood. Comparisons ii & iii will be made in the final quarter of the project.

10. **Building a mosaic of full GB land cover** has continued, with the data stored as 100 km tiles (Figure 3). These are made as 'jigsaws' from the appropriate sections of each scene. As a scene-classification is completed, the sections are 'cut out' and stored in their 100 km tile. Building the mosaic will simply involve butt-joining the tiles.

11. **Hard copy production** will result in new versions of the colour output maps once cover is complete.

12. **GIS demonstration** work continues using the 75 km x 50 km test area of cover-map centred on the Thames estuary. Various experiments will use overlaid thematic and topographic data which are currently being registered with the cover map.

    The cover data will also be summarised, as 1 km grid data, recording broad distributions of landscape components. This summary will be built into the Countryside Information System, a user-accessible, microcomputer-based, database for applications purposes. The data, combined with the ITE field survey summaries, will also improve cover-estimates derived from the latter, and allow sophisticated interrogation of the integrated datasets.

    So far, 36 out of a potential 49 x 100 km^2 have been processed to give 1 km^2 summaries.

13. **Pattern analysis** set out to examine patch size, size frequency, perimeter length, fragmentation and isolation, boundary length, density and diversity. These concepts can be readily defined in vector and the appropriate measures will be applied to demonstrator areas representing a variety of landscapes in Britain.

    In order to analyse pattern at the national scale, summaries at 1 km square level are favoured. Measures which can be calculated readily

from full resolution raster data and which will be available, at 1km level, in the Countryside Information System are:

1. **diversity** - number of cover types per 1km square or a diversity index (eg Shannon) which takes cover into account (these can be calculated from the percentage cover data, so this layer of information will not be added per se)

2. **boundary length per class per square**

3. **pairwise boundary combinations** (but with class list aggregated to 11 major types and with only ecologically meaningful pairs selected)

Again, 36 of the 49 x 100 km^2 have been measured and summarised at 1 km^2.

A fourth measure of pattern, looking at cover within fixed distances is computionally extremely expensive. The potential number of cover combinations and distance combinations is effectively infinite. Hence sample-area outputs will be made to demonstrate the potential, but future analyses will be tailored to specific user-requirements.

It is also proposed to undertake a small number of demonstrator projects in ecology to show how far landscape cover patterns can be related to population dynamics, distribution, dispersal and other important ecological variables. In addition, a number of other collaborative studies are underway (see Second Interim Report) which will form relevant examples of landscape pattern analysis in other areas of applied environmental research.

CONCLUSIONS

The rate of production continues to match original intentions. We still expect completion of the project in March 1993, with excellent levels of detail and accuracy.

FORWARD LOOK TO FINAL QUARTER

The aims for the quarter, January 1993 to March 1993 will be to:

1. Complete classification of the scene covering SE Scotland (completion expected end of December 1992); also the quarter scene of SW Scotland, and half scene of Sussex (both to be completed in January 1993).

2. Extract 100 km squares of above data

3. Complete raster-based measures of landscape pattern

4. Complete demonstrator pattern analyses in vector

5. Compare a further 8 pairs of field and Landsat 1 km squares in raster

6. Make comparisons of 256 squares using the grid-scoring method

7. Make comparisons of 533 squares as summary cover data

8. Undertake analyses for validation/integration with field data

9. Produce final reports

Figure 1

Planned schedule of activities and progress to date (black bars), 15 December 1992.

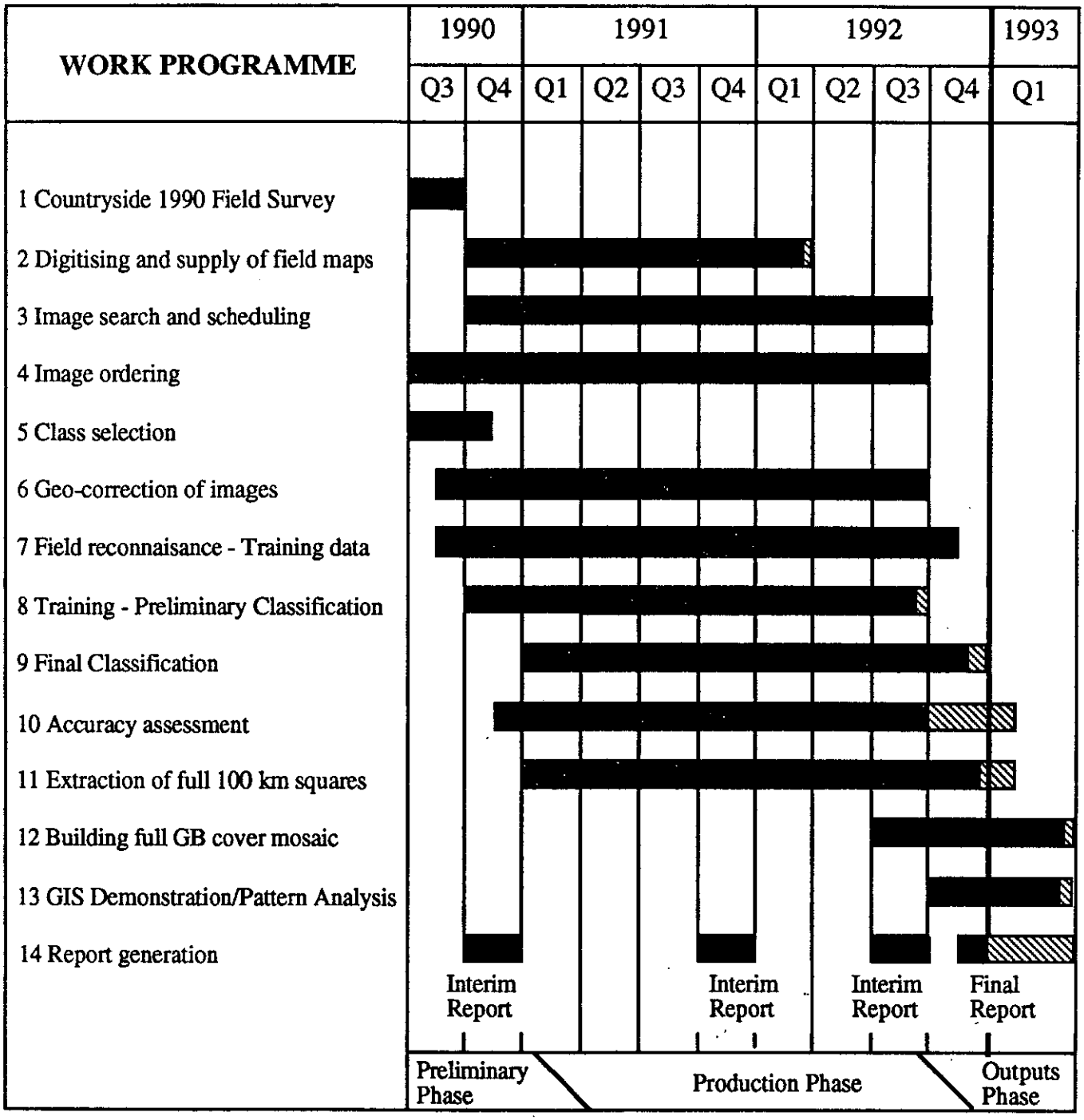


Figure 2

Status of data processing, 15 December1992

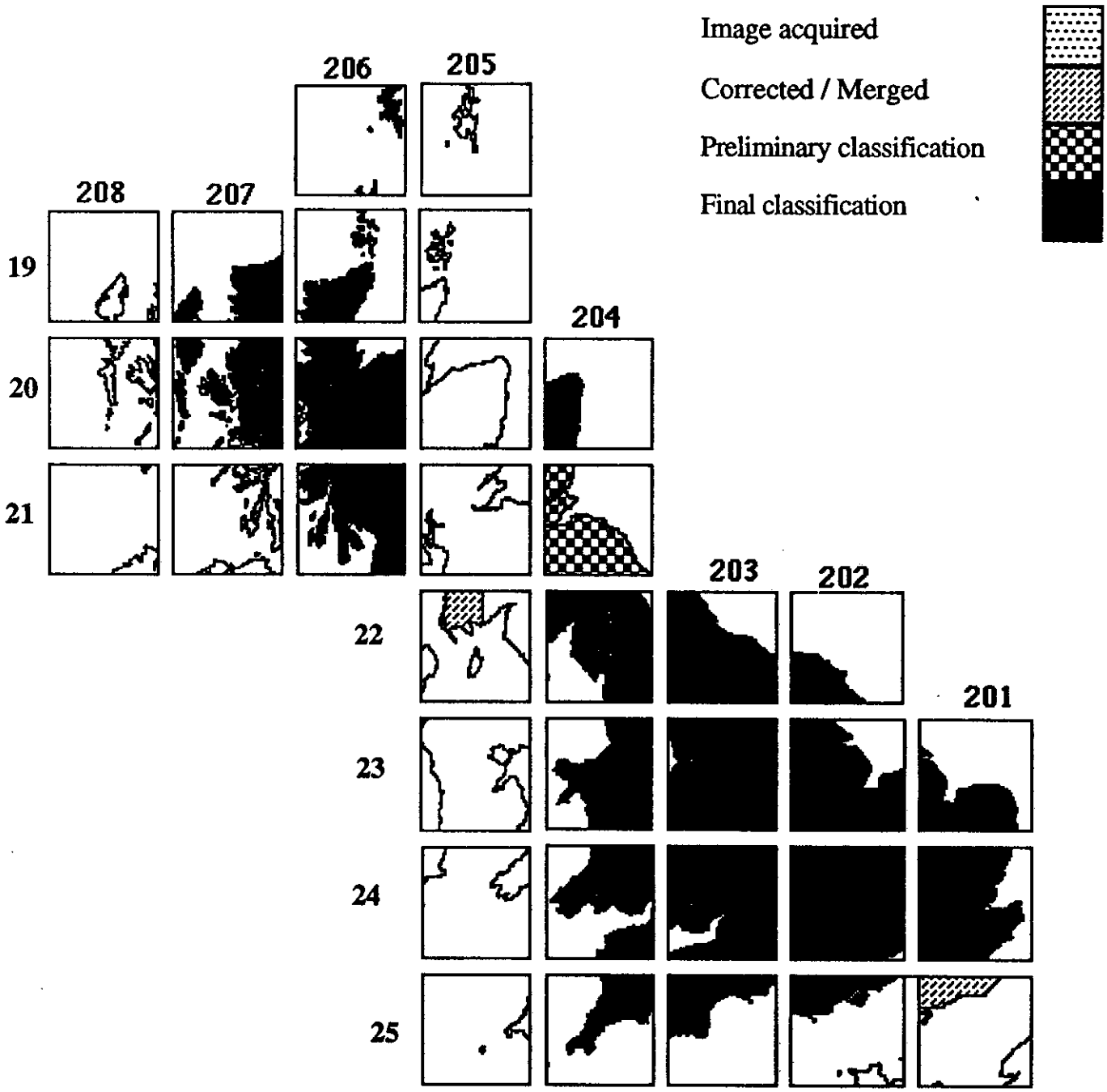
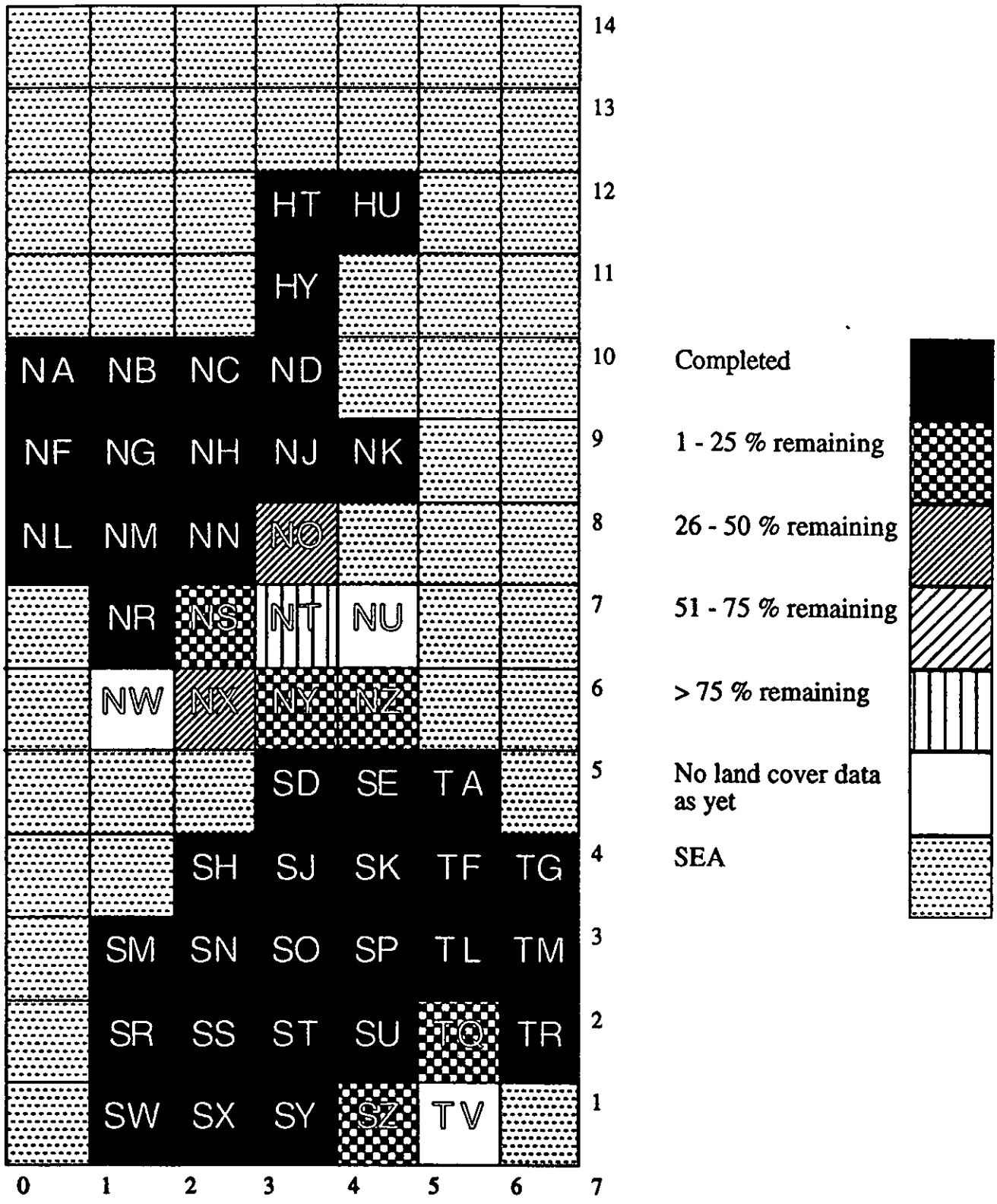


Figure 3

Summary of classified land area in each 100 km square, 15 December 1992.



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